

# **FIM global model update**

## **- new 1-year comparison with GFS**

Presented to NCEP Model Evaluation  
Group meeting  
6 June 2013  
Stan Benjamin

# FIM changes since April 2012

- Interpolation of initial conditions improved
  - Vertical: Temperature, height – now in Exner instead of pres
  - Horizontal: Winds interpolation improved near poles
- Interpolation of output – improved to vector interpolation near poles
- Model itself
  - Horizontal smoothing of hybrid isentropic-sigma vertical coordinate – reduced by factor of 3

Also tested but not improving skill yet

- 4<sup>th</sup> order momentum diffusion
- Janjic horizontal pressure gradient

In progress

- Testing of GSI/hybrid/ensemble with FIM (increment interpolation from FIM to GFS grid)
- Testing of multi-model ensemble with GFS – HFIP (real-time) and GEFS (retrospective) applications



Improvements since  
2012 are due to these  
improvements

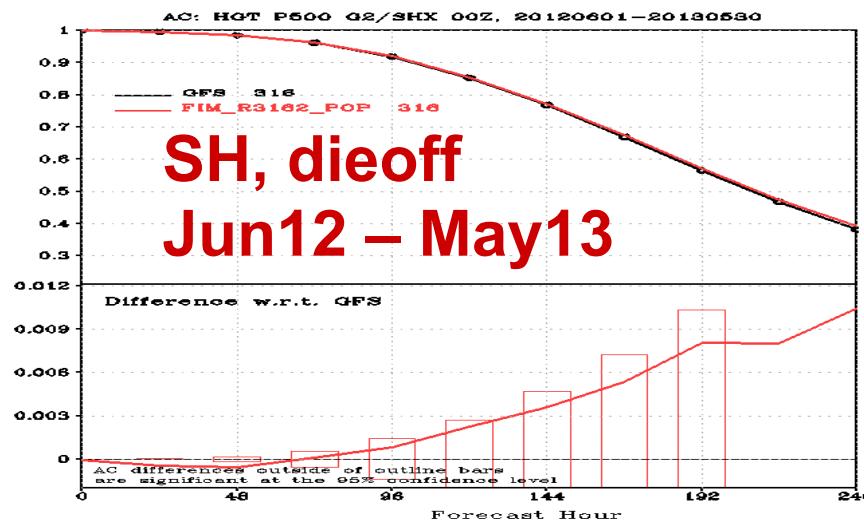
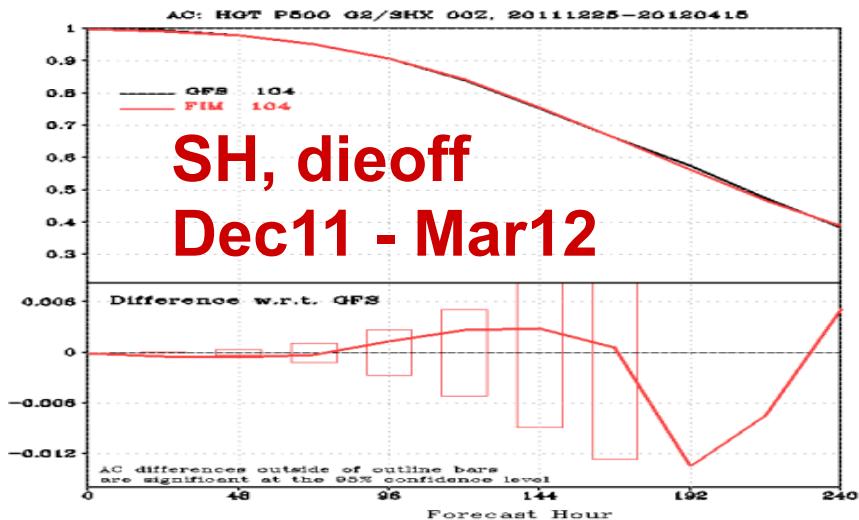
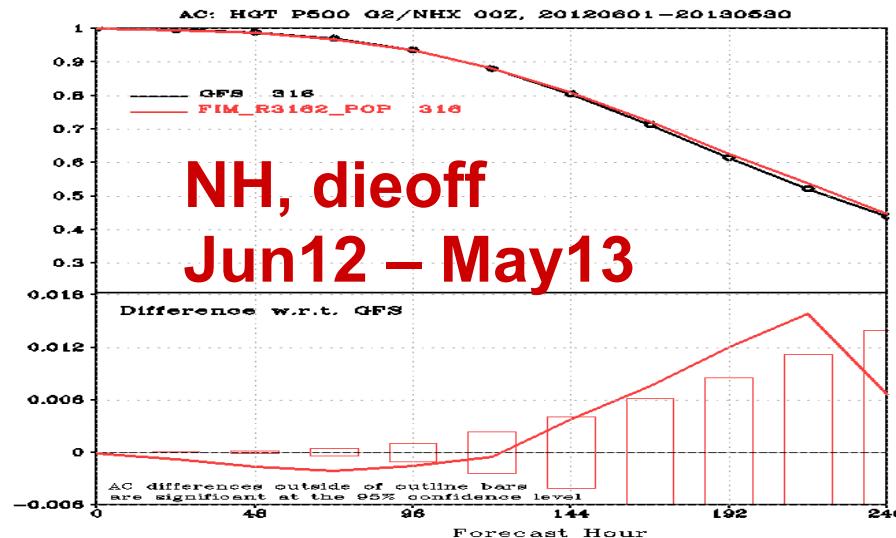
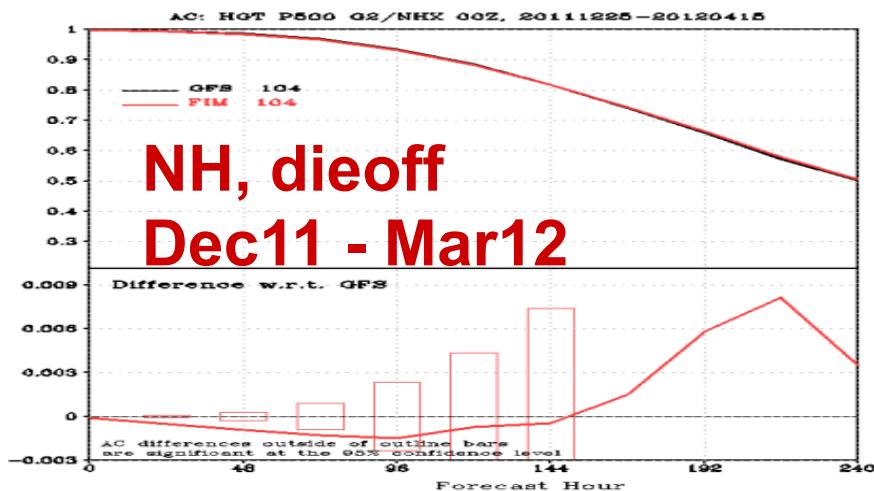
# FIM-GFS comparison

- Period – 1 June 2012 through 30 May 2013 (1-year comparison)
- FIM – initialized from GFS native analyses (sanl/sfcnl), i.e., FIM has not yet been fully cycled
  - ESRL now performing initial experiments with FIM using GSI-EnKF assimilation (Mariusz Pagowski, Jeff Whitaker)
- FIM runs – retrospective for 1 June 2012 through 17 March 2013 (real-time from 17 Mar 13 through May 2013)
  - Subversion r3162
- GFS – real-time runs
- NCEP verification used for analysis/grid verification
  - [http://ruc.noaa.gov/vsdb/fim\\_r3162\\_pop/](http://ruc.noaa.gov/vsdb/fim_r3162_pop/)
- ESRL verification used for raob verification (0.5 deg data used for both GFS and FIM)

From Stan/Fanglin seminar  
a year ago - April 2012

## 500-hPa Height Anomaly Correlation FIM-30km vs. GFS

Results from new FIM retro  
June 2012 through May 2013



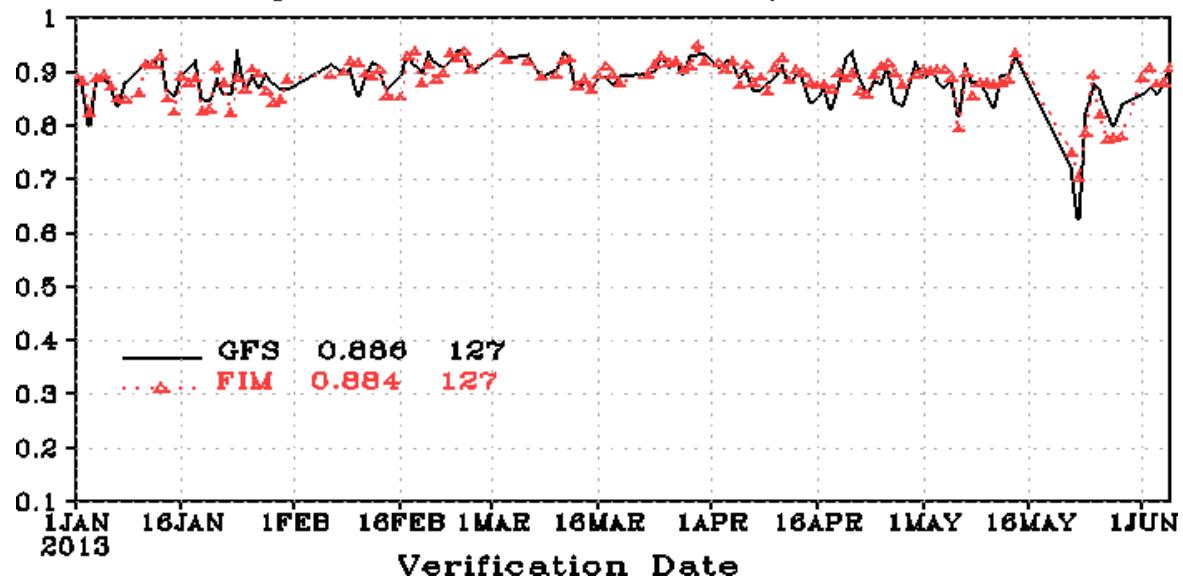
April 2012:  
“FIM and GFS similar forecast skill at 5d.”

June 2013:  
FIM and GFS still similar forecast skill at 5d  
– FIM better at 6+ days

# GFS and FIM configurations

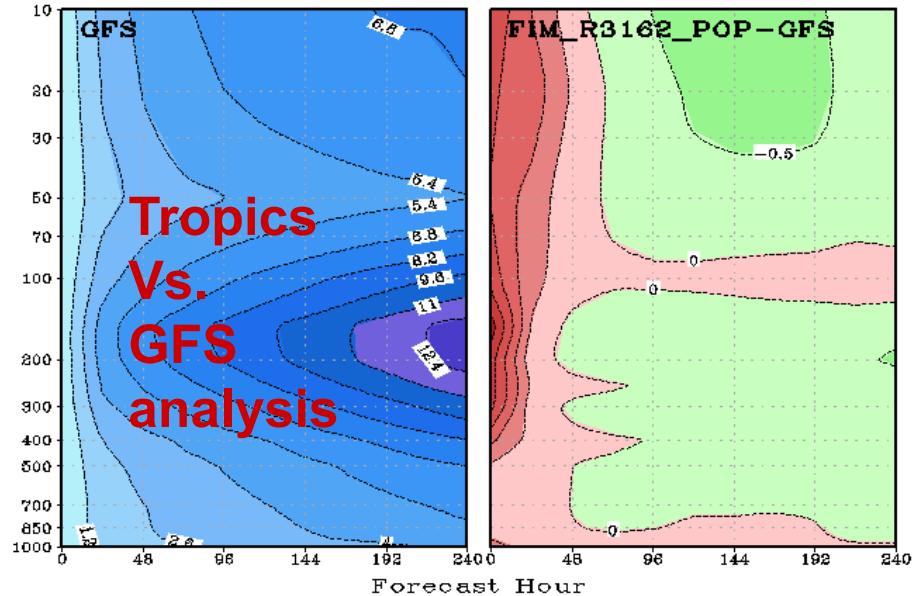
	Horiz resolution	Vertical resolution	Physics	Surface cycling? (SST, land-sfc)	Initialconds	Forward DFI	Terrain elevation, variance (for GWD)	Land-sfc type	Momentum diffusion	Top BC
GFS	T574 spectral	L64, sigma-pres hybrid	May 2012 GFS physics	Yes	GFS IC via GSI/hybrid DA	Y	GFS	GFS	Latest?	
FIM	30km icosahedral	L64 – sigma-isentropic hybrid	May 2011 GFS physics	No	GFS IC (no FIM cycling yet)	N	Elev: Recalculated from USGS global topo Var: GFS	GFS	2 <sup>nd</sup> -order, diff velocity = 1 m/s (3 m/s near top)	Rayleigh damping, strong with v> 100 m/s

Anomaly Correl: HGT P500 G2/NHX 00Z, fh120



[http://  
www.emc.ncep.noaa.gov  
/gmb/wx24fy/fim/](http://www.emc.ncep.noaa.gov/gmb/wx24fy/fim/)

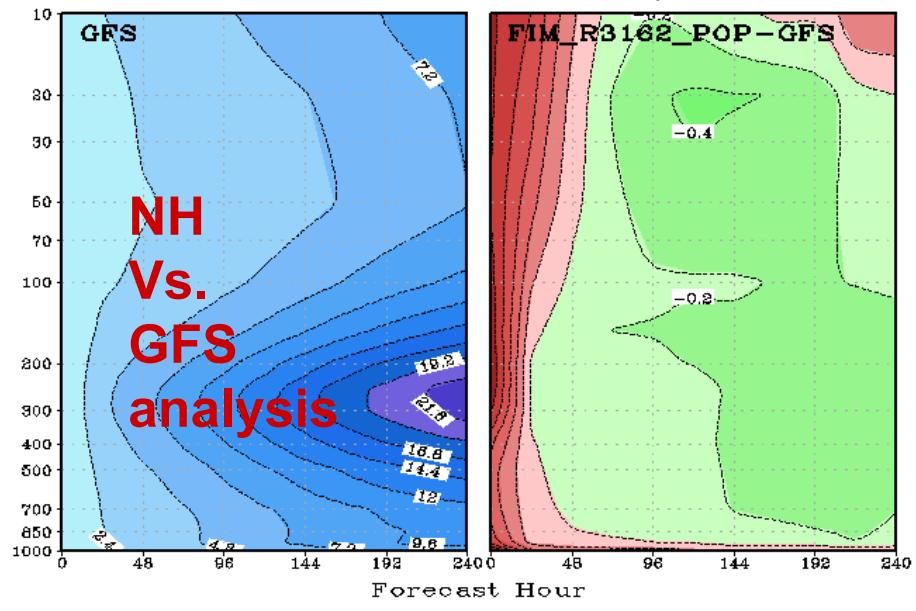
WIND: RMSE  
20120601-20130530 Mean, G2/TRO 00Z



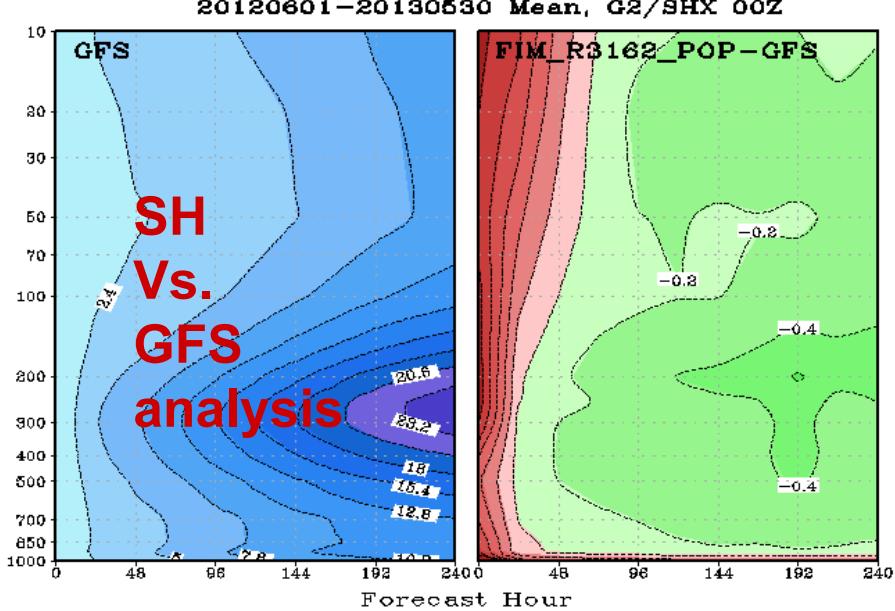
# Vector Wind RMSE FIM vs. GFS

Results from new retro  
June 2012 through May 2013

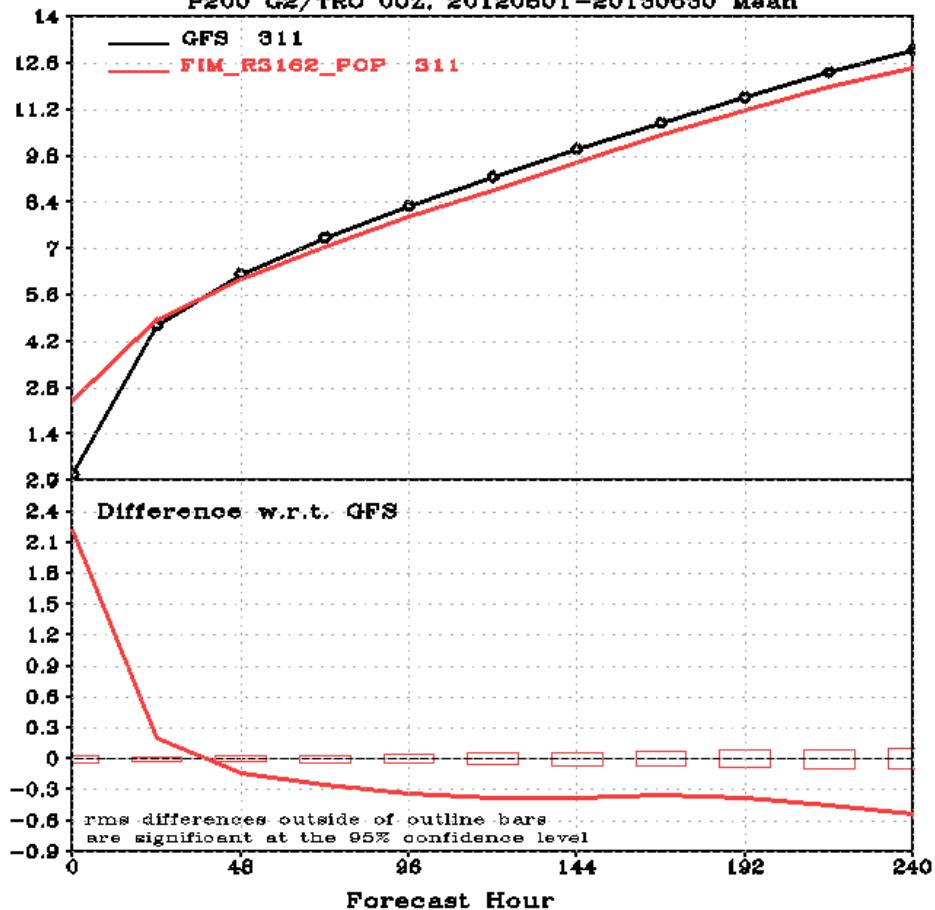
20120601-20130530 Mean, G2/NHX 00Z



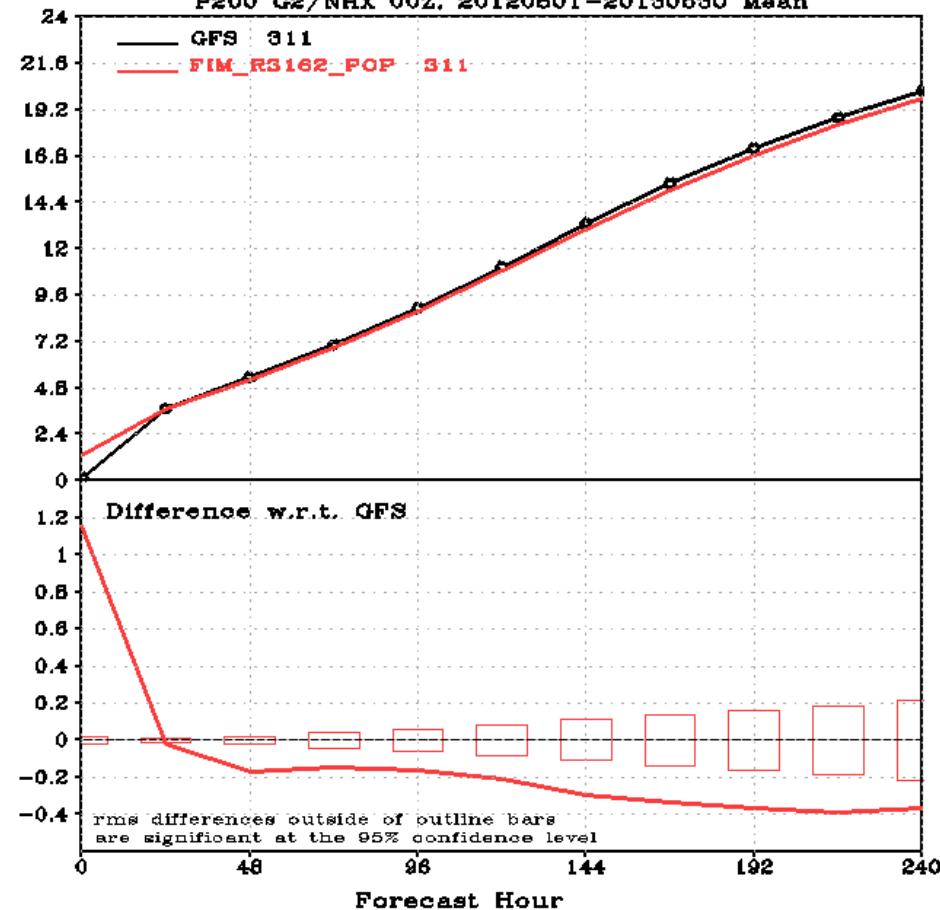
WIND: RMSE  
20120601-20130530 Mean, G2/SHX 00Z



WIND: RMSE  
P200 G2/TRQ 00Z, 20120601-20130530 Mean



WIND: RMSE  
P200 G2/NHX 00Z, 20120601-20130530 Mean

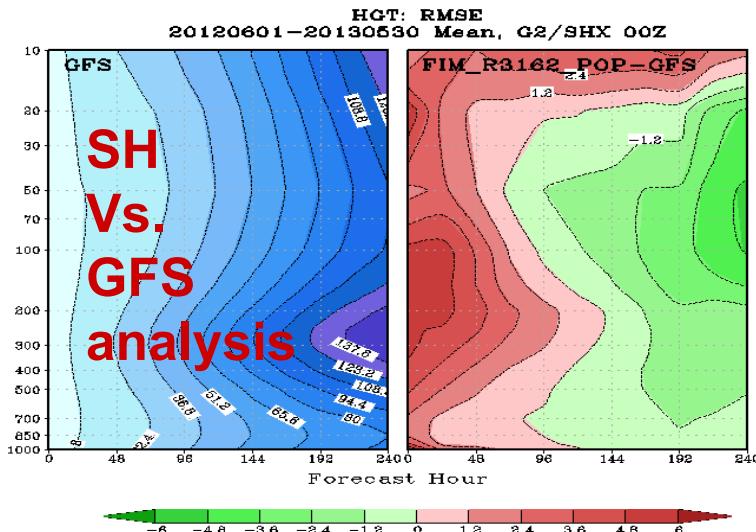
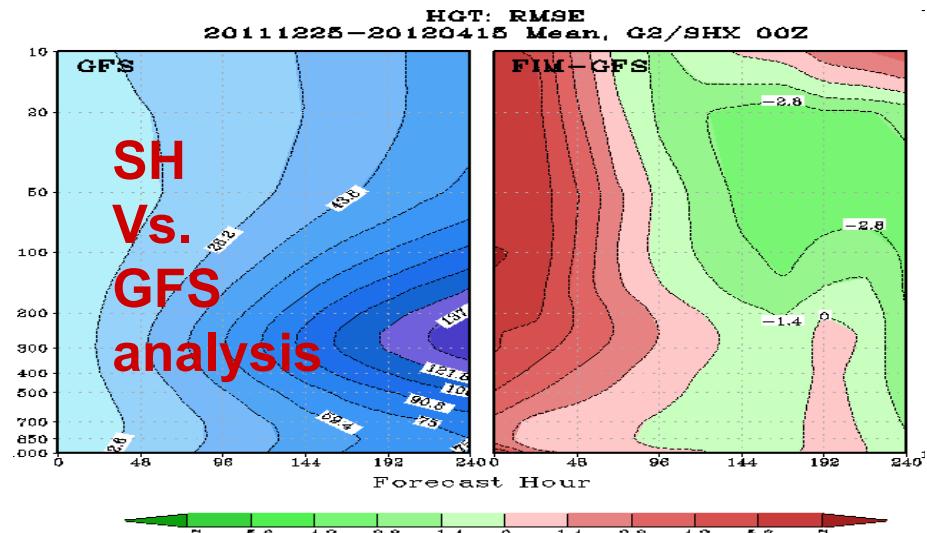
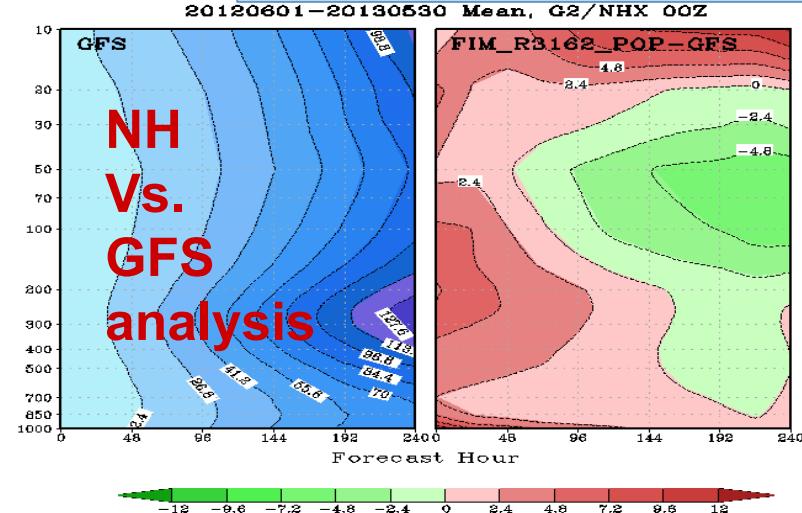
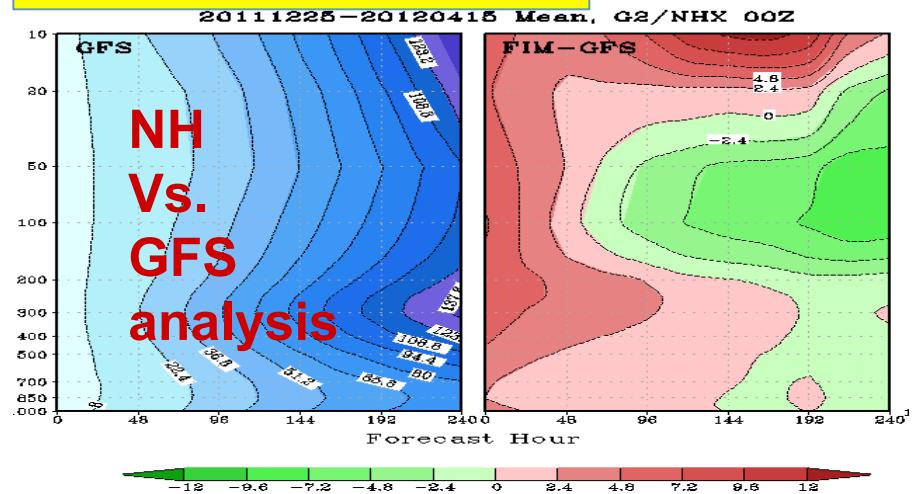


Results from new retro  
June 2012 through May 2013

From Stan/Fanglin seminar  
a year ago - April 2012

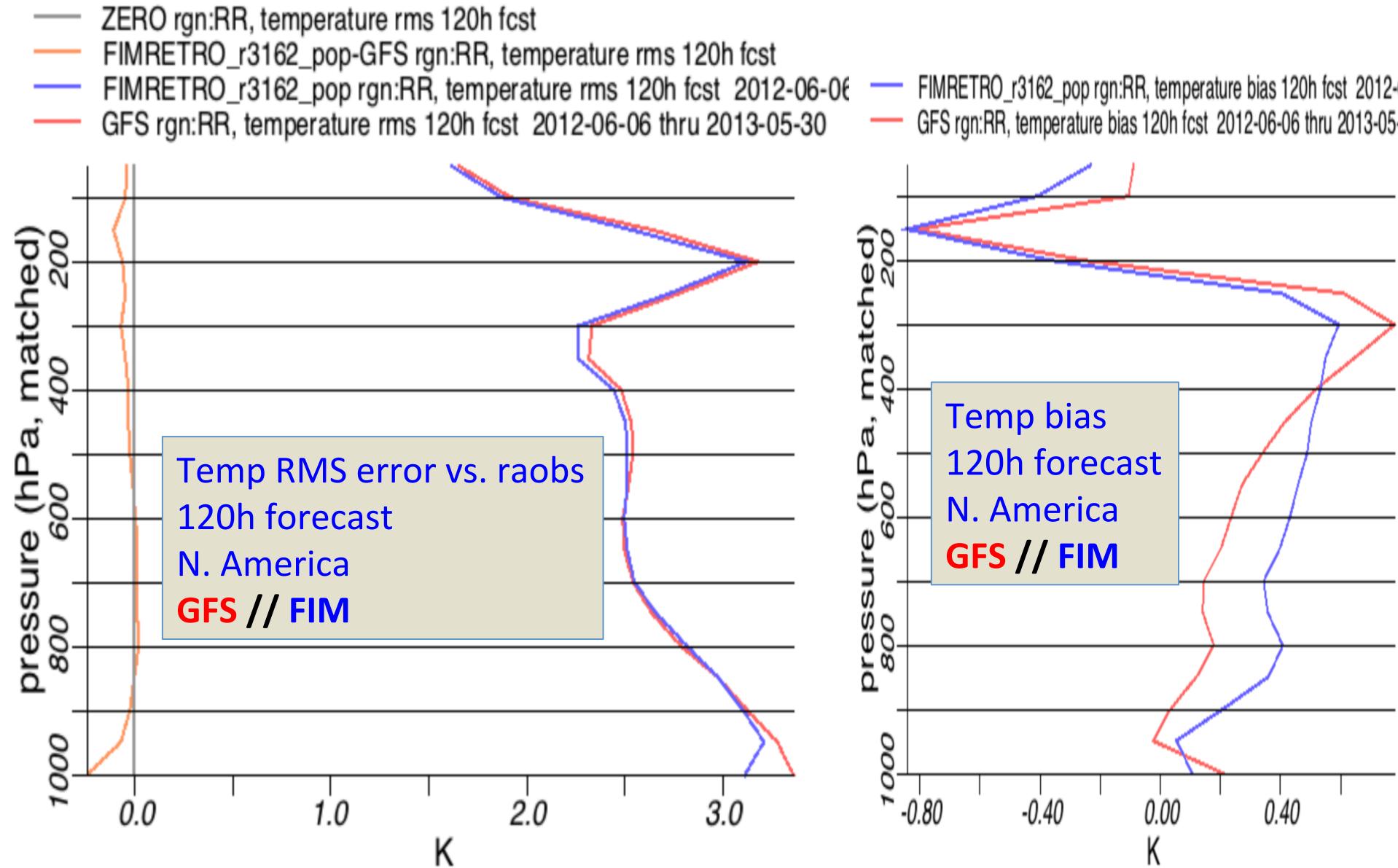
## Height RMSE

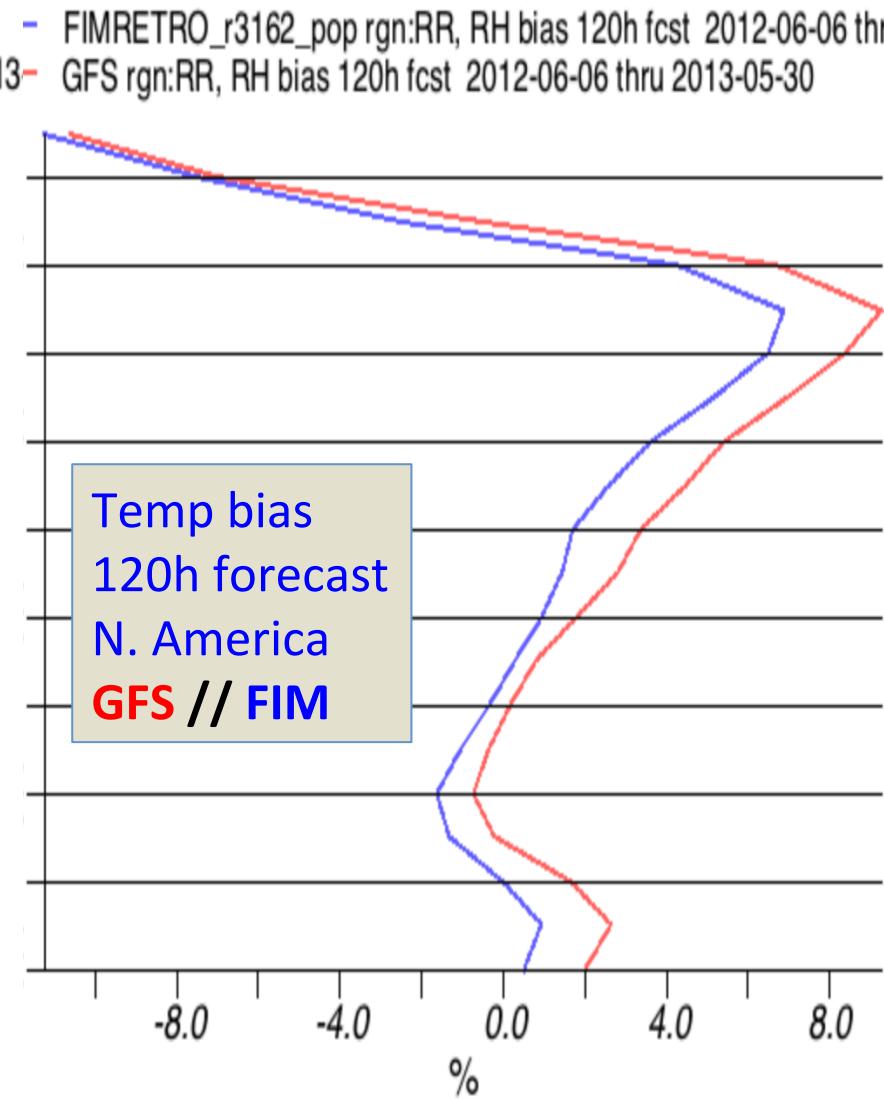
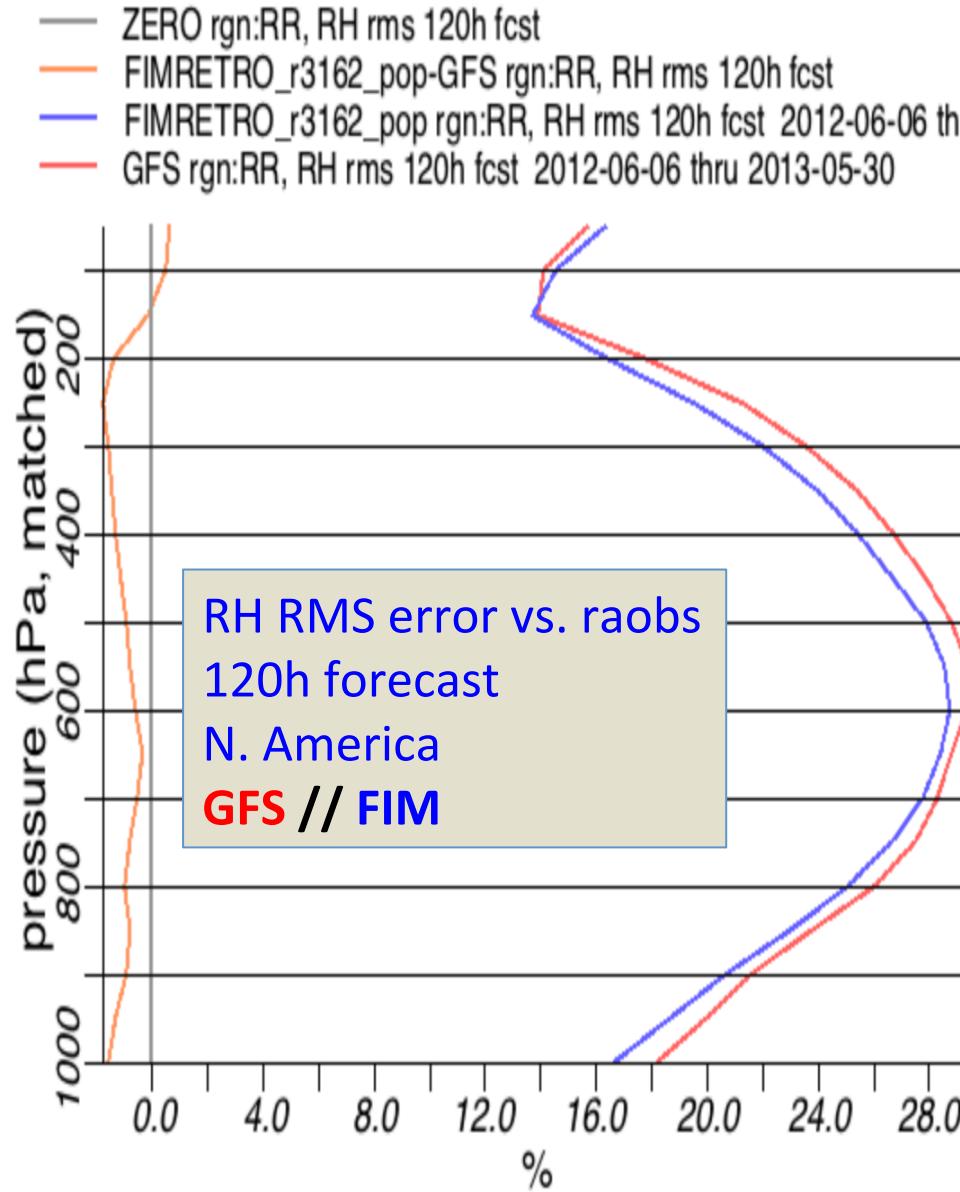
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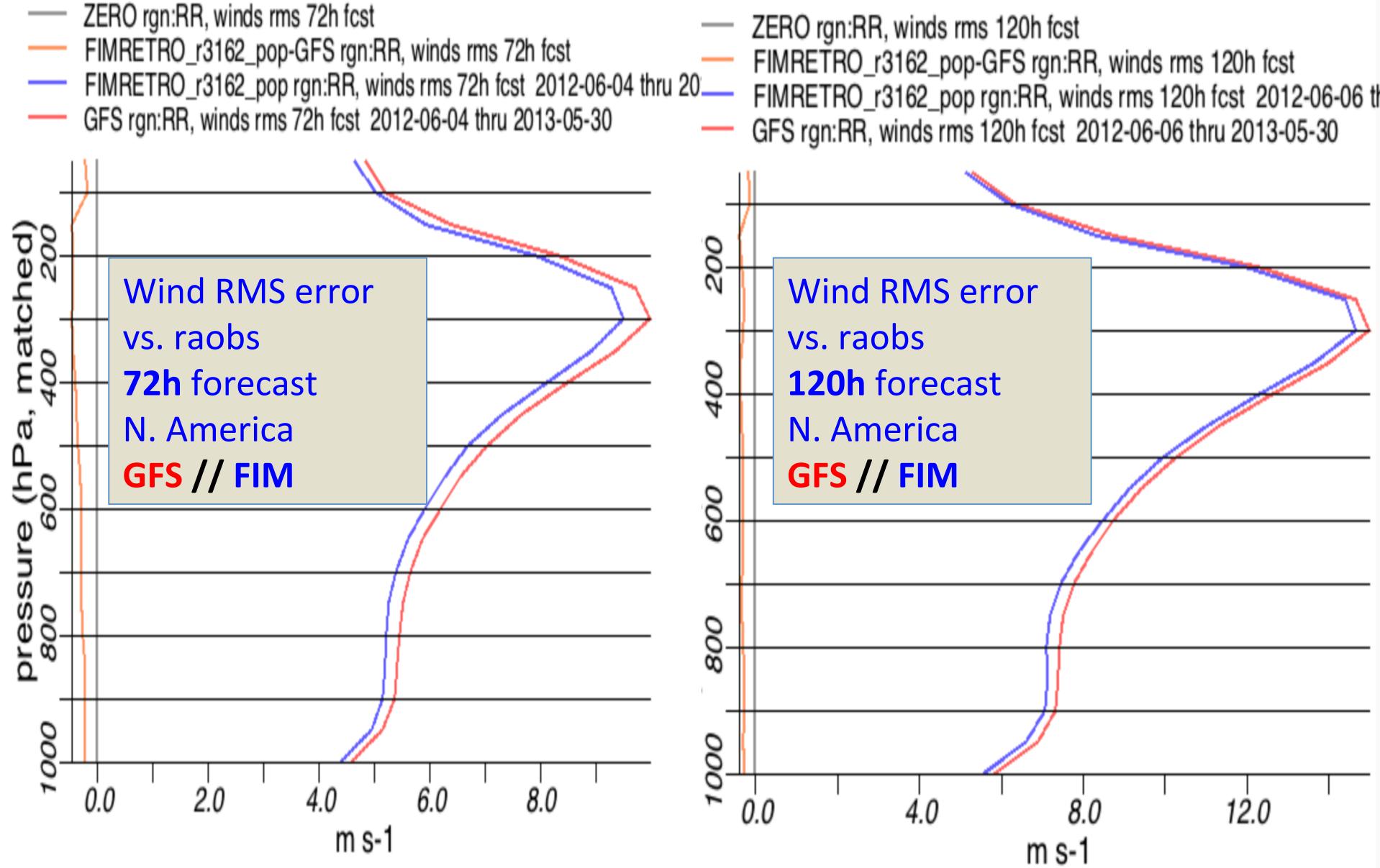


FIM has larger height RMSE than GFS at initial forecast hours, irrelevant to the choice of verifying analyses. (2013 improvement: interpolation from GFS to FIM for T and Z, stronger improvement from 6-10 days in new FIM version)

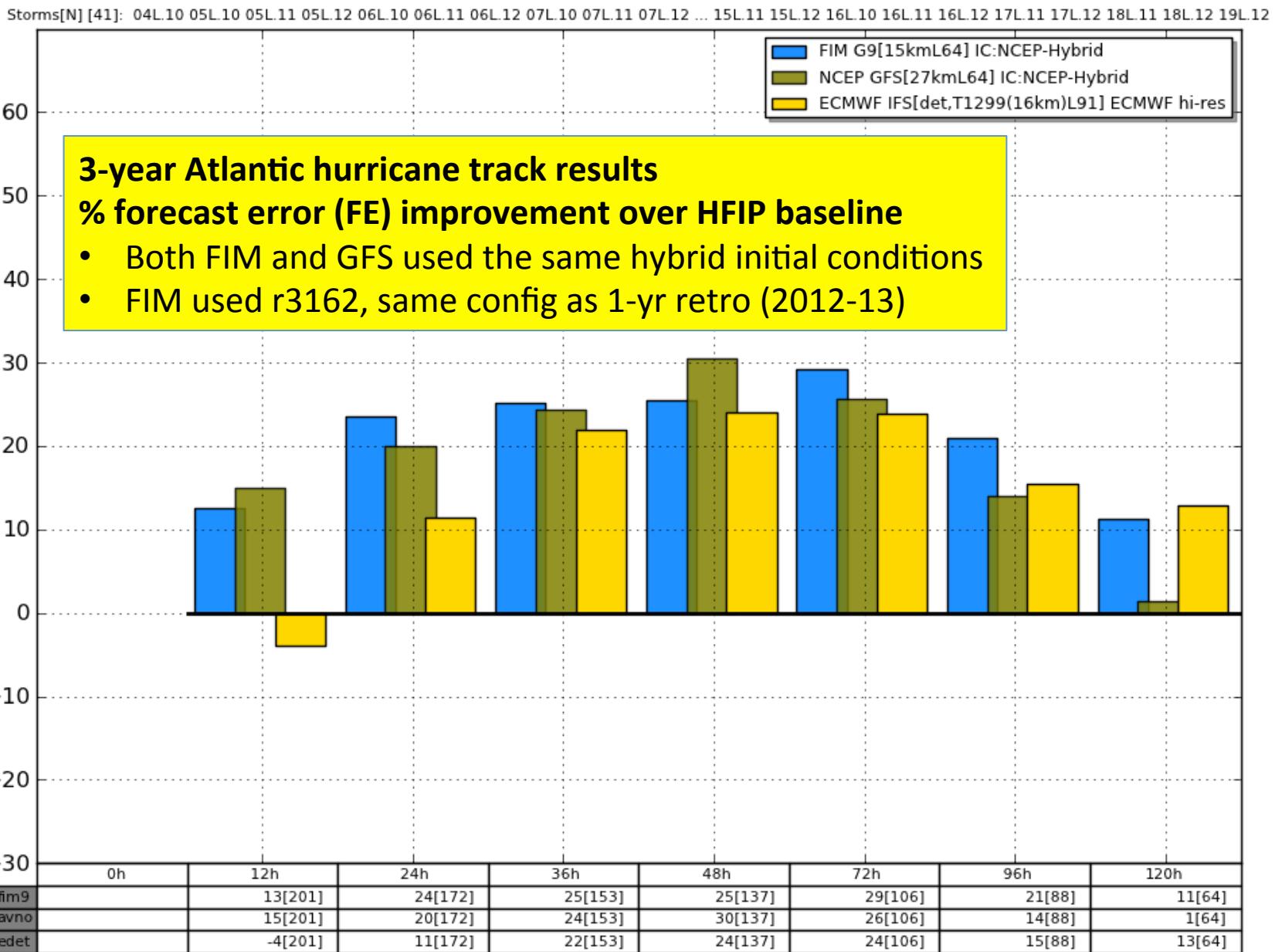
- **Verification against Upper-Air Rawinsonde Observations –**
  - **12-month period – June 2012 – May 2013**
  - **All raob stations over N. America used**







LANT 2010-2012 FIM9 v GFS v ECMWF track error %improvement over HFIP baseline  
 IC: NCEP-Hybrid



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